Physical rehabilitation of males-individuals with low back pain in the remission stage, using the healthy fitness tools

Volodymyr Kormiltsev
National University of Physical Education and Sport of Ukraine

Abstract

Background: In the article were based and developed the physical rehabilitation program with using a fitness tools aimed at restoring functional condition of individuals with low back pain in the remission. Also, there was developed a method of assessing the functional capacity level, includes a minimum number of informative and easy for measuring indices, that determines a transfer from period to period and further individualize rehabilitation in individuals with low back pain in the remission. The aim of the research was scientifically based and develop a physical rehabilitation program for males-individuals with low back pain in the remission stage, using the tools from healthy fitness.

Methods: we analyzed and summarized the data of medical records and fitness profiles of the males of the second adult age (n = 60), diagnosed low back pain in the incomplete remission stage, that bring it possible to identify the main disorders and identify the groups for further studies.

Results: the data, bringing after the experiment convincingly testify that the using the developed program in the incomplete and complete remission stages has allowed to reduce and stop the pain syndrome, restore joint mobility, improve the biogeometric profile of the posture, and increase the level of physical and functional condition of the body in the participants.

Keywords: physical rehabilitation, low back pain, functional status, remission, fitness.

Introduction

At the present stage of the society development, the problem of preserving and increasing health level, raising the physical activity, and preventing various kinds of chronic diseases of the population has acquired special social significance (N.I. Turchyna et al., 2010) [23]. Among the most common chronic diseases, the main place is occupied by the back pain (BP) (I.A. Zharova, 2003) [28]. According to the World Health Organization (WHO) data, BP, as one of the most famous musculoskeletal disorders, ranks third in the prevalence after cardiovascular diseases and oncological pathology (V.V. Povorozniuk, 2011) [21]. Analysis of the clinical cases of the patients with BP indicates shows that most often it does not arise because of the severity of the pathology (O.B. Lazarieva et al., 2010; V.V. Kormiltsev, 2014), because of the lack of rehabilitation programs aimed at strengthening of the spinal musculoskeletal apparatus in the remission period (L. Janssens et al., 2014) [9,12,14]. In the modern scientific literature there are many different tools and methods of physical rehabilitation of individuals with BP. There is a lot people for supporting the opinion about the positive effect of exercises, early mobilization and PNF in the treatment of patients with BP. At the same time, combinations of the tools and methods of physical rehabilitation and healthy fitness were used for increasingly intensifying the recovery process and for fast returning to the work (Y.C. Chen et al., 2012) [6]. Correctly selected types of physical and healthy fitness, as a functional training, training in the gym as well as their individual application to the patients, it contribute to strengthening

the muscles, improving blood circulation, forming the right motor stereotype, improving the function of body's organs, could strengthening the respiratory and cardiovascular systems (J. A. Wadsworth, 2009), it bringing to the decreasing of the intensity of the manifestations of BP [24].

Thus, it is considered promising of the development a physical rehabilitation program for people with low back pain (LBP) in the remission stage, using the tools from physical and healthy fitness. So, the aim of the research: scientifically based and develop a physical rehabilitation program for males-individuals with LBP in the remission stage, using the tools from healthy fitness.

Materials and methods

We analyzed and summarized the data of medical records and fitness profiles of the males of the second adult age (n = 60), diagnosed LBP in the incomplete remission stage, that bring it possible to identify the main disorders and identify the groups for further studies. The average age of the subjects was 38,6 ± 2,8 years ($\overline{x}$±S). Before the beginning of rehabilitation measurement, we have performed the data analysis from medical examinations performed by a doctor, fitness examinations, also we determined the functional condition, analyzed the heart rate variability and the biogeometrical profile of the posture. At the end of the rehabilitation course, we performed the determination the dynamics of the studied indicators among the subjects, it were used the assessment of the pain level, testing of the motor system, functional status, heart rate variability and biogeometrical posture profile were analyzed.

Instruments

For achieving this aim, the following research methods were used: analysis of the special scientific and medical literature; content analysis of clinical cases, the results of MR-examination; clinical method, as a quality of life assessment; educational methods as an educational experiment, observation, testing; medical and biological methods, as the heart rate variability (HRV), determination of physical condition by the formula of Y.A. Pirohova, assessment of adaptive capacity by R.M. Bayevskiy, assessment of the physical performance; computer photometry; mathematical statistics methods.

Data analysis

As the most typical average pain level on the Visual-Analog Scale (VAS) patients noted 2,72±0,42 cm. After the initial testing of the motor system, the result was 65,7±1,6 points ($\overline{x}$±S), which corresponds to a low level of the physical activity.

During the performance of the Romberg test, a tendency to reduce of the vertical stability was noticed, it may be due to the increased angles of the biogeometrical profile of the posture.

During the analysis of HRV, the indicator of the amplitude of mode (Amo) in the surveyed contingent was 78,1±5,5% ($\overline{x}$±S), it indicates to a predominance of moderate sympathicotonia. These data are confirmed by indicators of the stress index of regulatory systems (SI), which was 541,5±77,7 c.u., indicating on a pronounced sympathicotonia. At the same time, the activity index of the sympathetic nervous system (LF value) was 70,4±7,9%, the parasympathetic activity index (HF value) was 20,2±4,9%. The ratio of LF/HF was at the level of 3,7±1,1%, that indicates a temporary mobilization of the body. The level of the physical condition at the beginning of the experiment was 0,599±0,071 c.u. ($\overline{x}$±S), it brings to the medium level of the physical condition. PWC_{170} probe indicator in the participants of the experiment was 470,3±30,6 kgm·min.$^{-1}$, it brings to a low level of functional condition. The indicator of the adaptation potential at the beginning of rehabilitation was 2,6±0,1 c.u., it means the condition of functional stress. Based on the analysis

of the quantitative indices of the biogeometrical profile of the posture, two subgroups were formed: males with combined disorders of posture in the sagittal and frontal plane, there was 52% (n = 31) and males with disorders in the posture in the sagittal plane, there was 48% (n = 29).

Results

Based on the obtained data, we developed a physical rehabilitation program for males with LBP in the remission stage, using the tools from healthy fitness. The tools and methods of the program were selected, bringing the quantitative indicators of pain, physical performance and functional condition, SI of regulatory systems and biogeometric profile of posture. The course of physical rehabilitation was conditionally divided into three periods: adaptive, training and corrective and stabilization periods.

The males of the main group (MG) were engaged in a developed program, that included therapeutic exercises according to appropriate methods, mobilization techniques with elements of PNF, hydrokinetic therapy with aquafitness elements, corrective gymnastics, stabilization training, exercises in the gym and functional training. The males of the control group (CG) were offered similar health-improving measures according to the program of the fitness clubs and rehabilitation centers.

Adaptation period. Duration is 56-60 days, stage of the disease: incomplete remission. The objectives of the period were the preparation for increasing loads, the relaxation of spasms in the affected area, the restoration of the general tone of the body. The tools used in this period were therapeutic exercises, mobilization techniques with elements of PNF, hydrokinetic therapy with aquafitness elements.

Training and corrective period. Duration is 148-160 days, stage of the disease: complete remission. Objectives of the period were the correction of the biogeometric profile of posture and reflective spinal deformations, the elimination of pathological and biomechanical changes in the spine, prevention of recurrence of the disease. The tools used in this period were stabilization training, corrective gymnastics.

Stabilization period. Duration is 56-60 days, the stage of the disease was the complete remission. The objectives of the period were the strengthening of the muscles on the back and trunk, prolonging the remission stage, fixing the habit of motor activity as a lifestyle. Tools used in this period were functional training and gym training.

According to the data getting as a result of the application of the developed physical rehabilitation program, in the males either in MG or in the CG was observed an improvement in the physical condition. The indicator of the level of pain by the VAS first scale (pain level at this moment) was 1,3±0,4 cm. ($\overline{x}$±S) and it was different from the baseline as a 2,87±0,32 cm. ($p<0,05$); in the males from CG, changes in the assessment of the level of pain were statistically unreliable. The result of individuals by the VAS third scale (level of pain in best periods) was 0,71±0,38 cm., and it was statistically significantly lower ($p < 0,05$), then same indicator of the CG, it was 0,85±0,73 cm.

In the MG at the end of the experiment, according to the results of the motor tests, the total summary value, as a 77,4±2,2 points, was statistically significantly higher ($p < 0,05$), then in CG, it was 74,87±3,91 points ($\overline{x}$±S), that indicates on a high level of the functional condition of all parts of the motor system. Under the influencing of a rehabilitation complex, the dynamics of the Romberg test indices were changed, it caused by the positive dynamics in the all angles of the biogeometric profile of the posture in the MG.

At the end of the course of physical rehabilitation, in the males of MG the Amo

indicator was 40,8±5,7%, that indicates on a vegetative equilibrium of regulatory systems, in CG this indicator was 44,8±3,3%, that's also can be a sign of vegetative equilibrium (p<0,01). After completing the physical rehabilitation course SI in the MG was 112,1±22,8 c.u., in the CG this indicator was 126,6±16,1 c.u. Under the influencing of the developed physical rehabilitation program changed the parameters of the body's regulatory systems (p < 0,01). In the MG, the LF value decreased from 73,4±8,9% to 39,7±3,9%, in the CG, the same final indicator was equal to 41,9±2,3%. The indicator of the HF value in both groups decreased and at the end of the experiment in OG it was 19,6±3,2%, in the CG it was 16,5±5,1%. The ratio of the LF/HF values at the end of the experiment in both groups decreased (p < 0,01), in the MG it was 2,1±0,4%, in the CG it was 2,8±1,0%. These changes can be the indicators of the improvement in the parameters of the body's regulatory systems in representatives of the both groups (p < 0,01).

At the end of the experiment, there was an insignificant dynamics in determining the level of physical condition and adaptive potential, that's explained by the peculiarities of the physical rehabilitation technique for MG and CG. The differences between the groups are statistically significant (p>0,05). But at the end of the experiment in both groups there was a significant increasing the PWC_{170} probe index. In the MG the total probe index increased to 796,6±165,6 kgm·min.$^{-1}$, it brings to the higher-then-average level of physical working capacity, it also increased in the CG till the 735,4±150,6 kgm·min.$^{-1}$($\bar{x}$±S), it's also an indicator of the higher-then-average level of physical working capacity.

After the physical rehabilitation course of were fixed a positive dynamics in the angles of the biogeometric profile of posture in both groups (p < 0,01). At the end of the experiment, the angle β_2 in the MG was 3,3±0,1° ($\bar{x}$±S), it was also statistically significantly different (p < 0,01) from the CG same indicator, as a 3,9±0,1° ($\bar{x}$±S). The β_4 angle, before the experiment in the males from the both groups did not differ statistically significantly (p < 0,05). After the physical rehabilitation course, the OG indicator was 2,22±0,03°, it was statistically significantly different from the CG indicator - 3,0±0,1°. In the sagittal plane, the angle in the hip joint, α_4 during the first examination was 6,24±0,24°, after the physical rehabilitation course of its indicator approached to the norm, and in the OG it was 4,4±0,8°, that was less than the result in CG- 4,8±0,1° (p < 0,05). In the males with disorders in the sagittal plane, the angle in the hip joint α_4 during the first examination was 2,0±0,1°, as a normal rate is 4,5 °, and after the physical rehabilitation course its indicator approached to the norm, and was 4,1±0,1°, that's less in the CG, it was 2,9±0,1° (p < 0,05), this is a sign of normalization of lumbar lordosis.

Discussion

In process of the investigation were confirmed and moved for further developed the basic principles in the works of the P.R. Kamchatnova (2008), A.V. Klymenko et al., (2008), O.A. Pirogova (2009), E.V. Makarova (2011, 2012), Y. Sakai (2012), O. B. Lazarieva et al., (2013) about the increasing number of the BP manifestations, occupying one of the leading places in the structure of occupational diseases of the peripheral nervous system [10,11,12,19,22]. Confirmed the data on the effectiveness of the fitness means application of patients after surgical treatment of lumbar and sacral vertebral syndromes, at a remote stage [15,16,17].

We were confirmed the opinion of the V.A. Yepifanov (2008), A.M. Aksenova (2009), Y.M. Furman, M.A. Berezhna (2012) about the positive effect from physical exercises, mobilization techniques, hydrokineziotherapy in the treatment

of the LBP, particularly, on indicators of severity of pain syndrome [1,3,7,26]. Also confirmed data from V. Gorbunov (2008), J. Chandler (2011), W. Lee et al. (2011), Y.C. Chen et al. (2012), Y.D. Yoo Y.S. Lee (2012), that testifies to the positive influence of fitness on the condition of persons with LBP, in recent years in leading world scientific and medical publications there has been information about the using of elements of functional training, fitball-gymnastics, using the BOSU-platform and other equipment [5,6,8,18,27].

Scientific data of the M.I. Yabluchansky, A.V. Martynenko (2010) about the dynamics of indicators of the HRV in people with LBP in the remission stage in the physical rehabilitation process and Y.I. Belyak (2009), V.V. Biletskaya (2012) about the positive influence on the body of functional training, as a functional training affecting on the the scheme and work of the body as a whole, and not only its individual parts [2,4,25].

Conclusion

The developed physical rehabilitation program for males with LBP in the remission stage, using of the tools from healthy fitness is based on the results of previous examination and consists of three periods, there are: adaptation period, training and corrective period and stabilization period. The data, bringing after the experiment convincingly testify that the using the developed program in the incomplete and complete remission stages has allowed to reduce and stop the pain syndrome, restore joint mobility, improve the biogeometric profile of the posture, and increase the level of physical and functional condition of the body in the participants.

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Corresponding author address:

Kormiltsev V.

rectorat@uni-sport.edu.ua

National University of Physical Education and Sport of Ukraine

Fizkultury str. 1, Kiev, 03680, Ukraine

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